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THE MUSKRAT
AS A FUR BEARER

WITH NOTES
ON ITS USE
AS FOOD



THIS bulletin is intended primarily to show the economic importance of the muskrat, or musquash, our most valuable fur bearer, and to encourage further legislation for its protection. Although injurious in some localities, it is for the most part an inhabitant of places unsuited for agriculture. Its growing value for fur and meat makes it desirable to preserve and perpetuate this resource. To this end the bulletin gives an account of the muskrat's habits as well as of its commercial importance and suggests the private utilization of ponds and marsh lands for an increased production of fur and meat. Though mainly an abridgment of Farmers' Bulletin 396, the text has been revised to a considerable extent.

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THE MUSKRAT AS A FUR BEARER, WITH NOTES ON ITS USE AS FOOD.

By DAVID E. LANTZ, formerly *Assistant Biologist, Division of Economic Investigations, Bureau of Biological Survey.*

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IMPORTANCE OF THE MUSKRAT.

THE fur resources of the United States have diminished steadily during the last half century, and present conditions indicate a still further shrinkage of the supply. The decrease has been in quantity of the better pelts and not in total value of the annual catch. The large increase in value is accounted for by the advancing prices and by the large output of furs that formerly were neglected. The muskrat has been one of the chief factors in maintaining a high total value for our annual fur production and in commercial importance now heads the list of fur bearers of the United States.

Beavers, otters, martens, and fishers have disappeared from much of their former range, and even minks, raccoons, and skunks have become scarce in some localities. Muskrats have also diminished in places where marshes have been drained and where overtrapping has taken place. These animals multiply much more rapidly than the other fur bearers named, and because of their aquatic retreats and general habits are better fitted to maintain their numbers under reasonable protection. The present bulletin is designed to show their economic importance and to encourage further legislation tending to conserve an important resource. The harmful activities of muskrats are by no means forgotten, and methods for destroying the animals when they become noxious are presented.

DESCRIPTION.

The muskrat (see illustration on title page) is a rodent which when full grown is about four times as large as the ordinary brown rat. It has a blunt muzzle, a short and hardly noticeable neck, and a stout body. The tail is characteristic, about two-thirds as long as the head and body, compressed laterally, and tapering to a rather acute point; the thinly scattered hairs on the tail do not conceal the small but distinctly marked scales. The eyes are small, black, and beady. The ears are short, covered with hairs, and in winter almost wholly concealed in the fur. The incisors are large and without grooves. The legs are short, especially the front ones, and the feet are stout and provided with rather long claws. The hind feet are webbed slightly and so formed that they can be turned edgewise when carried forward while the animal is swimming.

Except the beaver no inland fur-bearing mammal of the United States leads a more aquatic life than the muskrat. Its characters especially adapt it to the water. Besides having feet specialized for swimming, it has a tail which serves as an efficient rudder, and fur which is practically waterproof. The long overhairs are close and glossy, and the underfur is exceedingly dense. The more common color of the muskrat is dark umber brown, the exact shade depending upon the season and the locality.

Fur dealers recognize only one variety of the muskrat differing from the common color. This variety consists of the dark, sometimes almost black, skins collected in the Chesapeake and Delaware regions, and in more limited numbers elsewhere. They are sold as "black muskrat," and command a higher price than the ordinary color. The form¹ from which most of the black skins are derived ranges chiefly in the tidewater region of the Atlantic coast from New Jersey to North Carolina.

The muskrat derives its name from the musky odor given off by certain glands. The odor pervades the entire skin to some extent, particularly in summer. Musquash is the Cree Indian name, and has the authority of long use, especially among fur dealers.

CLASSIFICATION AND DISTRIBUTION.

The muskrat² is related very closely to the common short-tailed meadow mouse, but is much larger, and has fur, feet, and tail more highly specialized for a life in the water. In addition to size, it differs from the meadow mouse particularly in having a long, narrow, rudderlike tail, which is nearly naked, about as long as the body without the head, and thickest along the middle line.

¹ *Fiber zibethicus macrodon*.

² *Fiber zibethicus*, subspecies.

Muskrats inhabit the greater part of North America from the northern limit of trees south about to the Mexican border. They are absent from the coastal parts of South Carolina, Georgia, Alabama, and Texas, and from Florida and nearly all of California. They do not occur in parts of the interior plateau that have no streams or lakes. Throughout their extensive range, except in Newfoundland and southern Louisiana, they are considered as of one species with about a dozen geographic races.¹

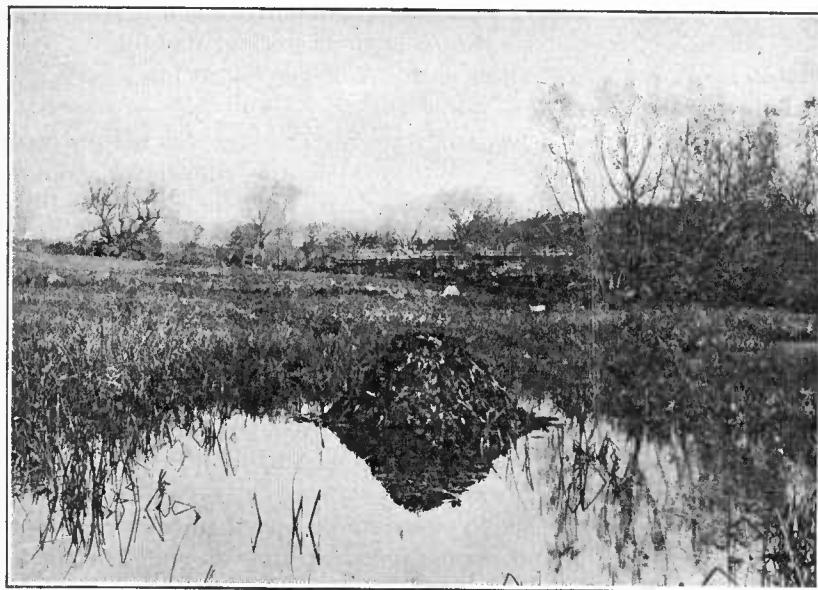


FIG. 1.—Muskrat house on Concord River, Mass. (Photograph by William Brewster.)

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GENERAL HABITS.

Muskrats are chiefly nocturnal, but they are much more active by day than many persons suppose. Where seldom disturbed they often may be seen at work in bright sunlight, especially at the season when they are building winter houses. These structures, though smaller and less strongly built, are in many ways similar to those of the beaver (fig. 1).

HOUSES AND BURROWS.

Muskrat houses are composed of rushes, grasses, and roots and stems of other aquatic plants. The structure rests on the bottom of a shallow pond, and is built mainly of the kind of plants on which the animals feed. These are heaped up without orderly arrangement

¹ For a full discussion of the distribution and relationships of the various forms, see North American Fauna No. 32, *A Systematic Synopsis of the Muskrats*, by N. Hollister, Biol. Surv., U. S. Dept. Agr., 1911.

until the domelike top rises 2 or 3 feet above the water. The mud on the outside and in the walls of muskrat houses seems to be collected accidentally with the roots. Within the part of the structure above the water a chamber is excavated, from which two or three passages lead downward through the mass into the water, reaching it at points well below the frost line. If the water is shallow, the animals excavate deeper channels leading from the house to various parts of the pond.

The houses are mostly for winter shelter and food and are seldom used as receptacles for the young. Occasionally, when driven from other houses or when excluded from underground burrows by barriers of ice or frozen ground, more than one family may occupy a single house temporarily.

When banks of streams or ponds are high enough for the purpose, muskrats burrow into them. Entrances to the tunnels are almost always under water, and the approach to them is, if possible, by channels of sufficient depth to prevent ice from closing the passage. The tunnels extend upward into the bank above the level of the water. They often rise to within a few inches of the surface of the ground and are frequently protected above by roots, by trees and shrubs, or by thickly matted turf. These tunnels extend 10 to 50 feet into the bank and terminate in a roomy chamber which sometimes contains a bulky nest composed of dried vegetation. Usually two tunnels lead from the nest to the water, and often a tunnel has two branches or outlets.

When burrows can be made, muskrats occupy them in winter and summer; but in shallow ponds and marshes, and especially in northern latitudes, the entrances are often closed by ice in winter. In such situations and when banks are not suitable for burrows, houses become a necessity, but they are seldom seen along the borders of deep ponds and canals, and, except in extensive swamps unbroken by hillocks, they are not found in the southern parts of the muskrat's range.

As cold weather approaches, the animals become very active, adding to their old winter houses, building new ones, and deepening channels that lead to houses and burrows. They do not hibernate, and, aside from the vegetation of which their houses are made, seem to make little provision for winter. However, some of the surplus food collected may be found in their burrows at almost any time.

BREEDING.

Early writers about the muskrat gave widely divergent accounts of its breeding habits. It is now well established that the animals breed from three to five times in a year and that the litters average from 6 to 8 young. The early spring litters are usually less in number,

and those of midsummer are somewhat above the average. The following are actual records secured by the Biological Survey: In February, 3 embryos; March 6, 3 large embryos; April 19, 6 small embryos; June 8, 8 embryos; June 18, 13 embryos. It is probable that the young of early spring litters breed in the fall of the same year.

A correspondent from Cambridge, Md., has furnished a detailed account of his observations during many years while residing near marshes and trapping in them. He makes the interesting statement that most of the young muskrats in Dorchester County marshes are born, not in burrows, for there are few places where burrowing is possible, nor yet in winter houses, although this is occasional, but in new nests which the female builds of grasses and dry plants, but without roots or mud. Such a nest is placed above the reach of tides in a brush pile or a bunch of growing plants. He states that he often has found young muskrats in these nests, which are far less bulky than the winter houses. He is uncertain as to the period of gestation, but thinks it is less than a month.

All recent testimony shows that in their breeding habits muskrats are not unlike field mice. The conclusion is further strengthened by the remarkable way in which the marshes, depleted by vigorous winter trapping, are replenished before the opening of another season. The known facts may be thus summarized: Normally the animals mate in March and the first litter is born in April; a second litter is due in June or early in July; and a third in August or September. In favorable seasons a fourth or even a fifth litter may be produced. The period of gestation is possibly no longer than 21 days, as with the common rat and probably with the field mouse. The young are blind and naked when born but develop rapidly. Outside of low marshes, muskrats usually are born in the underground burrows.

MIGRATIONS.

Muskrats often wander over fields and along highways far from water. This occurs late in fall, early in spring, or during severe droughts late in summer. The causes are not understood, although the spring movement has generally been attributed to the beginning of the mating season. When met away from water, the animals sometimes show considerable ferocity and have been known to attack persons savagely without apparent provocation.

The local movements of muskrats, both overland and along streams, make it difficult to protect canals and artificial ponds from the animals. They promptly find their way to new ponds built several miles from their former known haunts. Irrigation canals and ditches likewise are invaded throughout their entire length so nearly simul-

taneously that it is hard to believe that all the animals could have reached them through the head gates.

FOOD.

Like nearly all rodents, the muskrat is chiefly herbivorous, but it sometimes indulges in animal food, a habit which it shares with many other gnawing animals.

Its chief food in winter consists of the roots of aquatic plants—pond lilies, arums, sedges, and the like—but in some localities it feeds on mussels and also on carp and other sluggish fish that bury themselves in mud. When ponds are frozen over, muskrats are restricted almost wholly to food accessible under the ice, but in rare cases they leave the water and burrow under the snow in search of the crowns of grasses and sedges.

The summer menu is far more extensive, being made up of many aquatic plants—roots, stems, leaves, and fruit—and in addition, of supplies from near-by fields or woods. Muskrats are fond of nearly all garden vegetables—cabbage, onions, carrots, parsnips, beets, peas, beans, celery, and the like—and they frequently do considerable damage in gardens close to their haunts.

INJURY TO CROPS.

Damage to crops by muskrats is confined to limited areas. On low-lying lands bordering streams they sometimes attack corn or other grains, the injury usually being restricted to narrow belts near the water's edge. Sometimes growing corn is eaten to the ground, but the damage is greatest when it is in the roasting-ear stage. The animals then cut down the stalks to reach the ears, which they carry to their burrows. Injury to other grains, except rice, is generally slight.

Losses of garden crops on bottom lands are more serious than the losses of grain. The black alluvial soils of creek bottoms are especially adapted to growing vegetables which here escape the effects of summer drought; and the farmer, especially in some of the Western States, often chooses for the vegetable garden a plat near the water. The muskrat frequently invades such plats and destroys the vegetables.

Reports of losses of turnips, celery, melons, and other crops due to muskrats are heard occasionally, and also losses of fallen apples when the trees are close to the water.

The muskrat is an enemy of the rice planter, but fortunately it is absent from many of the southern districts that produce rice. In Louisiana, however, it is a recognized pest in the plantations. It burrows in the embankments, thus flooding or draining the fields at

the wrong time, and often feeds on the growing crop and breaks down the plants.

Where muskrats are abundant they are destructive to waterlilies grown in private grounds and public parks, and often by their depredations make it difficult to establish the lilies in new situations. The common white waterlily is said to be less subject to injury than the odorless species, and the so-called lotus, both native and introduced species, is most frequently injured.

INJURY TO TIDAL MEADOWS.

Along the Atlantic coast are large areas which are overflowed by salt water at highest tides, but which produce useful though coarse grasses. Dikes are sometimes built over the low places to exclude the tides, and thus the quality of the hay is improved and cutting by machine made possible. The embankments have gates to permit drainage of surface water and to admit the tides when desired. Muskrats often gnaw holes in the gates or burrow through dikes and flood the lands, much to the annoyance of the salt-water farmer. Although this flooding of meadows results in inconvenience, the losses are not great. It is highly probable that if the muskrats were properly protected they would yield better returns to the owners of the land than are now obtained from the hay.

INJURY TO DAMS AND EMBANKMENTS.

The most serious damage by muskrats is to dams and embankments. Milldams, canals, irrigation ditches, ice ponds, and river levees are more or less subject to injury from these animals. They delight in the deep water of artificial reservoirs. Whenever a canal is built along a river valley, large numbers of muskrats promptly desert the river for the new waterway and pierce the embankments with their burrows. Where the berm bank of the canal is high, little harm is done on that side; but on the other bank and in places where the berm slopes downward, water often penetrates the burrows and disastrous breaks follow. It must be admitted, however, that sometimes the muskrat is blamed for breaks actually caused by crawfish, pocket gophers, moles, and even the common brown rat.

In irrigated sections of the West, ditches and reservoirs are sometimes injured by muskrats, requiring costly repairs and involving serious delays in the distribution of water to growing crops. Most canal and irrigation companies find it profitable to employ watchmen to patrol the embankments and look for burrows of muskrats, gophers, and other animals.

The breaking of milldams in districts where manufacturers depend on water power is often due to muskrat burrows. In the spring of

1904, near Thomaston, Conn., muskrats burrowed through a dam, wrecking it and releasing the water, which injured property in the town to the extent of several thousand dollars.

In April, 1904, the waters of Saline River in southern Illinois invaded the Equality mine and threatened the lives of about a hundred miners. Investigations showed that the waters of the swollen river had reached the mine by way of muskrat burrows.

Instances of the destruction of railway embankments due to muskrats and water are not rare. Injury to live stock through stepping into burrows of muskrats is not infrequent, and in one instance a costly driving track which had been constructed near a marsh was abandoned because of continued burrowing beneath it by these animals. A shell road in Dorchester County, Md., built across an extensive marsh, the superstructure resting on timbers lying on the ground, was so undermined by muskrats that it often became unsafe and was a constant source of expense to the county.

INJURY TO FISH.

Muskrats sometimes eat fish, but they capture sluggish kinds mainly and seldom harm game fish. A few years ago, when carp were introduced into many parts of this country, it was found that muskrats sometimes invaded ponds and destroyed the carp. This would not now be regarded as a serious loss.

Muskrats cause some loss to the fish culturist by injuring his ponds and possibly by destroying the food of fishes.

THE MUSKRAT AS FOOD.

The flesh of the muskrat for human food is variously esteemed, considerable diversity of opinion being expressed as to its palatability. One writer declares emphatically that its musky flavor would keep any but the starving from eating it. Another declares that the muskrat is game worthy of an epicure, with a flavor somewhat like the wild duck that has been shot in the same marshes where it has fed. A number of persons have likened its flavor to that of the famous terrapin of the Chesapeake.

The fact remains that muskrats are sold extensively in some of the markets of the East and Middle West. In the retail markets of Philadelphia, Baltimore, Wilmington, and other cities they are sold as "marsh rabbits," but no attempt is made to conceal the fact that they are muskrats. They are bought and eaten both by well-to-do citizens and by the poorer people who seldom indulge in high-priced game. The animals are trapped primarily for their pelts, but after they are skinned, the additional labor of preparing the meat for market is so slight that they can be sold very cheaply.

In the Baltimore markets muskrats are on sale from the middle of December to the middle of March. They are received by commission houses mostly from the lower Chesapeake, but supplies have come also from Louisiana and have arrived in excellent condition. The wholesale price (in 1923) usually is about 10 to 12 cents each and the retail price 20 to 25 cents. The average weight of a carcass is about 1½ pounds.

PREPARING AND COOKING.

The flesh of the muskrat is dark red in color but fine grained and tender. Unfavorable opinions as to its flavor arise, probably, from lack of skill in cooking or from carelessness in skinning the animal. In the usual method of skinning, the hair side of the pelts does not come in contact with the flesh, the musk glands often come off with the skin, and only in summer does the musky odor pervade the flesh. An unskilled person is more likely to leave some of the odor, but in winter it may all be removed by washing. The novice should be careful to keep the fur from touching the flesh, to avoid cutting into the musk glands, and to trim off any glands that may adhere to the meat.

RECIPES FOR COOKING.

Fried muskrat.—Wash the muskrat thoroughly and cut in quarters. Let it lie in salt water for an hour or more, then wash, dry with a cloth, and season. Dip the pieces in a prepared egg batter and dust them with flour or meal. Place the lard in a frying pan and let it get hot. Then put in the muskrat and fry very slowly for an hour. Prepare a gravy of milk, butter, flour, and parsley and season to taste. After it thickens pour it over the cooked muskrat.

Roast muskrat.—Wash the meat thoroughly, let it lie for an hour or more in salt water, and then wash again. Put it in a pan with water, salt, pepper, butter, and a little onion; sprinkle flour over it and baste it until it is thoroughly done.

Stewed muskrat.—Wash the meat thoroughly, cut it in pieces, and let it lie in salt water for an hour. Then wash again, put it in a saucepan, and season with butter, salt, and pepper to taste. Let it simmer slowly, and when nearly done put parsley and a little chopped onion into it. When entirely done thicken with a gravy of flour and water, as for stewed chicken.

The slightly gamey flavor of muskrats prepared by the above recipes is liked by most persons. Should it be objectionable it may be overcome by soaking the meat overnight in salt water.

MUSKRAT FURS.

In the raw state the fur of the muskrat is dense and soft and in general appearance much like that of the beaver. However, the pelage is shorter and less close and the pelt somewhat inferior in durability. The color varies with season and locality. Northern skins average lightest in color, being often a light silver gray, sometimes nearly white on the underparts. This is probably because

many are taken in summer pelage. Very dark skins, classed as black, come mainly from New Jersey, Delaware, and Maryland, but are produced in limited numbers in other parts of the United States and in Canada.

Compared with most other furs of such small size, muskrat furs are of excellent quality and durability; their cheapness is chiefly the result of their abundance. The earliest demand for the fur was for the manufacture of so-called beaver hats, it making an excellent imitation. When silk replaced fur in hat manufacture the demand for muskrat skins fell off greatly. They next became popular as imitations of sealskin. Properly dyed and made up they are difficult to distinguish from the genuine, but their wearing qualities are inferior. Modern fur dressers and dyers have found means of imitating many of the more costly furs with that of this animal, and have thus created a continuous demand for the pelts.

TRADE IN MUSKRAT FURS.

The growth of the demand for muskrat furs is shown by the records of London importations and sales. From 1763 to 1800 (38 years) the average number of skins imported and sold annually in that market was less than 75,000. During the 50 years from 1801 to 1850 the average was about 411,000. From 1851 to 1900, inclusive, the importations averaged over 2,534,000 yearly; and during the 10 years, 1901 to 1910, the average rose to 4,223,000. In recent years the London sales were as follows: 1911, 5,197,530; 1912, 5,014,921; 1913, 6,876,417; 1914, 10,488,647; 1915, 3,500,000 (approximately). The decreased importations for 1915 are explained by the European war. When it is remembered that a constantly increasing number of muskrat furs are dressed and manufactured in America instead of going through the London market, the foregoing statistics show a remarkable increase in the utilization of this fur. Notwithstanding the fact that during the past century and a half over a quarter of a billion muskrats have been taken for their pelts, the supply has not diminished greatly. It is probable that with adequate protection in the breeding season, from ten to twelve million pelts can be taken annually in North America without depleting the supply.

The prices paid for muskrat pelts vary considerably from year to year. In 1919 the skins brought from 12 cents to \$5.10 each; in 1920 they ranged from 13 cents to \$4.55 each; in 1921, from 8 cents to \$2.58 each; and in 1922, from 12 cents to \$2.46 each. Since 1919 the prices have been lower, but probably they never again will reach the low levels that were current during the period of the early eighties.

TRAPPING THE MUSKRAT.

Muskrats are not suspicious and are trapped easily. They take any suitable bait readily, especially in winter and early in spring, when green food is scarce. The majority of those captured in the ordinary steel trap are caught by the front leg. A strong trap breaks the leg bone and in struggling the animal may tear loose, leaving a foot, or part of it, in the trap. For this reason traps should be set so that the captives will drown quickly.

The best baits for muskrats are carrots, sweet apples, parsnips, turnips, or pieces of squash. Many trappers use scent to attract the animals, but it is doubtful whether the smell of musk or of any of the oils, as anise or rhodium, has advantages over the natural odor of the baits named.

Most muskrat trappers use the ordinary steel trap (No. 1). The manner of setting it depends upon the situation, and the skill of the trapper is best displayed in selecting this. Muskrat trails may be found along the banks of all streams and ponds which they inhabit, and the practiced eye often can trace them into shallow water. Sink the trap in the trail, partly in the mud or sand where the water is 2 or 3 inches deep, and fasten the chain to a stake, or, better still, to a slender pole reaching into deep water. The pole, upon which the ring of the chain is to slide, should have a fork at the outer end to prevent the ring from slipping farther, and the other end should be stuck firmly into the bank. Fasten the bait to a stick set in the mud, so that the bait is about a foot above the pan of the trap. The animal in reaching for the bait sets the hind foot upon the pan and is caught more securely than if taken by the fore foot. It immediately plunges into deep water, sliding the chain along the pole as far as it will go, and soon drowns. If the chain is fastened to a stake, it should be planted in water a foot or more in depth, so that the animal will drown.

Setting traps inside or near muskrat houses is to be condemned; many States have laws forbidding the practice and some of them specify the minimum distance from the house at which a trap may be placed. A long plank 5 or 6 inches wide or a floating log or one extending out into the water may be used advantageously as a support for traps. The plank is moored to the shore by a wire passed through a staple driven into one end and the other end is anchored in the stream or pond. Light cleats are nailed to the upper side at intervals, with space enough between them to hold a trap when set. Shallow notches wide enough to hold the traps may be cut into the log, and the traps covered lightly with fine leaves or grass. The ring at the end of each trap chain is fastened to the plank by a staple.

Baits of carrot or apple may be scattered; but they are not necessary, since the animals use such a device as a highway to reach the shore. An animal venturing upon it is almost sure to be caught. In this way many occupants of a pond may be taken in a single night.

The box trap is a favorite with some trappers. This consists of a wooden box with a gate at each end, the cross section inside measuring about 6 by 6 inches. The gate is of wire and is arranged to swing inward but not outward. The box is set just under water with one end at the entrance to a muskrat burrow. The animal lifts the gate on leaving the burrow and is imprisoned and drowned. Others follow until perhaps all the occupants of the burrow are caught. A similar trap may be made entirely of heavy wire netting of half-inch mesh, bent to shape. These traps are well adapted to very narrow streams or ditches.

An open barrel sunk in the soil close to the bank of the stream or pond frequented by muskrats is considered an effective trap. The top of the barrel should be level with the surface of the ground.

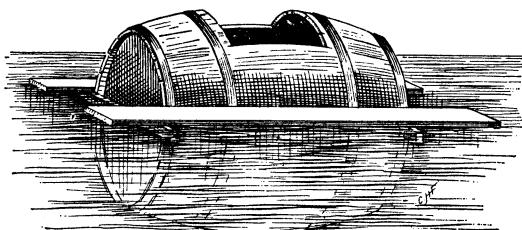


FIG. 2.—Floating muskrat trap.

The barrel is half full of water, upon which pieces of carrot or apple are floating. A piece of board about 8 inches square or a few floating chips will delude the animals into jumping into the barrel to secure the food.

A floating barrel is a good substitute for a sunken barrel. A hole 8 to 12 inches square is sawed in the side of a barrel having both ends intact. A strong cleat is nailed across each end, projecting 6 or 8 inches on the sides. Upon the cleats boards as long as the barrel or somewhat longer are nailed. Enough water is placed inside to make the barrel float with the outer platform level with the surface of the pond—say, with about one-third of the barrel exposed (fig. 2). Apples or carrots are placed inside for bait.

CARING FOR THE SKINS.

Muskrats taken for the fur should be trapped—not shot or speared. If taken alive in a trap they should be killed by a sharp blow on the back of the head. Trappers usually carry a short club for this purpose.

Muskrat skins intended for the market should be "cased," not opened along the belly. In skinning, begin at the heel and slit up the middle of the hind leg to the tail, around it, and then down the other leg to the heel in the same way. No other cuts are needed,

though many trappers pass the knife around the feet, where the long fur ends. Then turn the skin back over the body, leaving the fur side inward. The skin peels off easily to the front feet. Cut closely around nose, ears, and lips, so as not to tear the pelt. If bits of flesh adhere to the skin about the head, they may be scraped off, but this is usually left to the fur dresser. The skin, inside out, is stretched over a thin board or a shingle of the proper shape (fig. 3), and a tack or two is inserted to keep it in position to dry. Stretchers made of heavy galvanized wire are now extensively used by trappers and have advantages over the wooden kind (fig. 4). Skins should be dried in the open air—not before a fire or in the sun. They should not be exposed to rain. Books on trapping usually give full directions for caring for raw furs.

HOME DRESSING OF FURS.

Formerly many muskrat skins were home-tanned and made into caps, collars, and other articles. At present the home utilization of skins is much less extensive, but knowledge of a good method of dressing the fur is still desirable. Most of the methods employed by amateurs involve the use of alum to fix the hair; but satisfactory results, so far as pliability of the pelts goes, depend largely upon the labor bestowed on them.

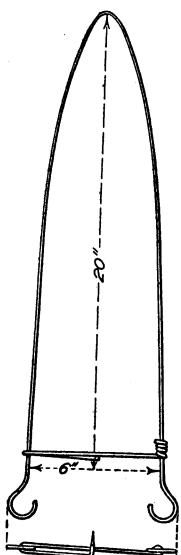


FIG. 4.—Wire stretcher for muskrat skins.

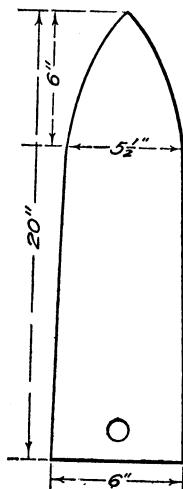


FIG. 3.—Wooden stretcher for muskrat skins.

The directions here given, if followed, will give better results than the use of alum. Prepare a tanning liquid composed of a quart of salt and one-half ounce of sulphuric acid to each gallon of water. This mixture should not be kept in a metal container. Muskrat skins (not cased) are tanned in this mixture in a day, but they may remain in it longer without injury. When removed from the liquor, wash several times in soapy water, wring as dry as possible, and rub the flesh side with a cake of hard soap. Then fold them in the middle, lengthwise, over a line, hair side out, and leave to dry. When both surfaces are barely dry, and the interior is still moist, lay them over a smooth, rounded board and scrape on the flesh side with the edge of a worn flat file or a similar blunt-edged tool. In this way an inner layer is removed and the skins become nearly white in color. They are

then stretched, rubbed, and twisted until quite dry. If parts of a skin are still hard or stiff, the soaping, drying, and stretching process should be repeated until the entire skin is soft. Fresh butter, or other animal fat, worked into skins while they are warm and then worked out again in dry hardwood sawdust, or extracted by a hasty bath in gasoline, increases their softness.

USE OF MUSKRAT FUR.

Many of the muskrat skins now used in America are dressed in the United States. Formerly they were dressed in Leipzig and other European fur centers. The cased skins are often split laterally into back and belly parts, the former often being sheared and dyed a rich brown in imitation of fur seal. The handsome garments made of these are called "Hudson seal" in the fur trade. The belly strips usually are dressed in the natural color and are used for lining over-coats and other outer garments.

Muskrat skins also are used extensively to imitate mink and sold under such trade names as "river mink" or "ondatra mink." However, the better grades of muskrat, dressed in the natural color and unplucked, have a very beautiful luster and make very handsome coats, boas, and muffs. Muskrat fur also is used to make small articles of apparel, as gloves, caps, and collars; and waste pieces from the furriers' cutting rooms are utilized for hatters' fur.

MUSKRAT FARMING.

It has been proved by experiments with muskrats in captivity that the animals are easily kept, become very tame, and breed in very narrow quarters. The value of the skins, however, does not warrant commercial attempts to produce them under such restricted conditions. Until recently the prices were too low to permit expenditures on preserves or even efforts to prevent poaching. Now carefully guarded preserves will yield steady and profitable returns. All that is needed is care not to deplete the fur supply by too close trapping.

SOME EXAMPLES.

Muskrat farming is already a prosperous business. On 5,000 acres of marsh at the mouth of the Maumee River, near Lake Erie, controlled by a hunting club of Toledo, Ohio, the muskrats had been undisturbed for two years prior to the winter of 1903-4, when they were trapped for the benefit of the club. Five thousand were taken in a single month (January, 1904), and the skins were sold for 25 cents each. The carcasses also were sold at \$1 a dozen.

The muskrat industry probably has reached its highest present development on the eastern shore of Maryland. The extensive marshes of Dorchester County are a center of muskrat fur production.

Formerly the land was considered almost useless, as it is subject to tidal overflow. Now, owing to the increased value of fur, many of the marshes, measured by actual income, are worth more than cultivated lands in the same vicinity. Trapping privileges are leased, usually on the half-and-half plan, and trappers and owners unite to protect the marshes from poaching.

A few specific examples will give a better idea of the value of these marsh lands. The owner of one tract informed the writer that he bought it several years ago for \$2,700. It is leased for half the fur and in 1909 yielded him \$890, or about 33 per cent on the investment. A small piece of marsh—about 40 acres—was bought in 1905 for \$150. Leased for half the fur, it yielded the owner \$40, \$60, \$70, and \$100, respectively, for each of the four years, 1906 to 1909. Taxes on this land are very light, and on the basis of a 6 per cent income the returns for 1909 would represent an approximate value of nearly \$40 an acre. The owner of a 1,300-acre tract of marsh, who traps with the aid of his sons, in two seasons, 1909 and 1910, secured over 12,000 muskrats, which sold for more than \$9,000.

The muskrat skins sold in this region are seldom assorted before sale. They are separated into black and brown lots and then counted, a deduction of from 3 to 5 per cent being made for the young, known as "kits." The skins sold throughout the season of 1917 brought 35 to 45 cents for brown and 60 to 75 cents for black. The proportion of black skins varies on different parts of the marshes from 10 to 60 per cent, the average being about 40 per cent.

Muskrat meat is an additional source of income to the trapper. It is bought by local buyers and sold for local consumption or shipped to outside markets, all being utilized. The Baltimore market absorbs the bulk of the shipments. In 1909 the wholesale price was about 4 cents a carcass; in 1917 it ranged from 10 to 13 cents.

The editor of the Cambridge (Md.) Record stated that the muskrat industry of Dorchester County brings into the community about \$100,000 annually. This would indicate that the average catch is about a quarter million animals. Owing to continued cold weather in 1917, the catch probably did not exceed 150,000, but the high prices prevailing brought the income nearly up to normal. The danger of exhausting the supply by continued close trapping has been discussed in Dorchester County, but trappers maintain that with the long closed season, March 16 to December 31, little ground for anxiety on this score exists.

POSSIBILITIES OF THE BUSINESS.

Muskrats require no feeding, since the plant life of ponds and marshes furnishes abundance of food. In many States the areas adapted to the muskrat are extensive, and doubtless suitable areas

could be found in sections from which muskrats are now absent. As trapping is done in winter, the business of muskrat farming is especially adapted to farmers and farmers' boys.

The improvement of the muskrat's pelage by selective breeding has never been attempted. Probably the black muskrat could be bred true to color and greatly improved in the localities it now inhabits, and could be introduced successfully into other sections of the country. Indeed, to make the most of the muskrat industry requires that the possibilities of selective breeding be tested.

DESTROYING MUSKRATS.

Its destructive habits make the muskrat a pest in comparatively few places. On the whole, and especially in large marshes and uninhabited sections, its economic value far outweighs the harm it does. On many of the streams it inhabits, no attempts have been made to impound water for use, and hence the animal does not interfere with engineering operations. In all such situations and in swamps the muskrat should have ample protection to insure a present and future fur supply. The present value of the pelt is an incentive to excessive trapping.

Mill owners and superintendents of canals, irrigation works, and levees sometimes are confronted with the necessity for active operations against muskrats, and should know the more effective methods of combating them. It must be confessed that the usual means have not been very successful. Bounties have never effected more than a temporary reduction of their numbers. Shooting ordinarily makes the survivors exceedingly wary. Trapping is more successful, but it can seldom be carried to the limit of practical extermination.

Methods of trapping are effective in both summer and winter, but when green food is abundant greater care is needed in the selection of baits. With enough steel traps placed in favorable locations the danger to embankments may be diminished greatly. The barrel trap will sometimes bring quicker relief, since it often captures an entire family of muskrats at one setting. Whenever possible, trapping these animals should be deferred until their skins are prime.

Muskrats can be destroyed much more rapidly by poisoning than by trapping. Powdered strychnin sweetened with powdered sugar or commercial saccharin and sprinkled over freshly cut pieces of apple, carrot, or ripe squash has proved effective in many cases. Crystals of the same poison inserted in the baits with a knife also have given good results. Care must be taken to keep poisoned baits *where they will not endanger other valuable wild or domestic animals.*

PROTECTING PROPERTY FROM MUSKRATS.

The use of concrete foundations of proper depth for dams reduces to a minimum the danger of injury from muskrats. The modern dam or weir is always safe from their attacks.

Probably the most successful means of protecting earthen embankments is to employ a skillful trapper to patrol them regularly, using traps, poisons, and a small caliber rifle. The patrol is usually charged with the additional duty of watching for and promptly repairing slight breaks in the embankments.

Several methods of keeping muskrats from injuring small ponds have been recommended. One is the liberal use of gravel or coarse sand for the surface of embankments, since the animals will not burrow in soil that fills the hole as fast as they open it.

The best means of protecting the vegetable garden from muskrats is to erect a fence of netting, either surrounding the garden or skirting the bank of the adjacent stream or pond. The netting should be of galvanized wire 3 feet or more in width and of $1\frac{1}{2}$ -inch mesh. The lower edge should be sunk 6 inches into the soil to prevent the animals from digging under.

ENEMIES OF THE MUSKRAT.

Man is by no means the only destroyer of the muskrat. Among its natural enemies are the coyote, fox, mink, the larger hawks and owls, and the pickerel. But all of these enemies together do not greatly affect its numbers.

The proposed reclamation of swamps and marsh lands throughout the country, if carried out, will greatly reduce the number of muskrats by restricting their habitat, and if the supply of this fur is to be maintained it must be through protection and eventually through private ownership.

PROTECTIVE LAWS.

The earliest act for the protection of fur animals in America was the Massachusetts law of 1791, which prohibited trapping fur animals, including the muskrat, during the months of June, July, August, and September. An act passed by New Hampshire in 1821 protected beavers, minks, otters, and muskrats from May 1 to November 1 of each year. The New Jersey law protecting muskrats, passed January 21, 1829, continued in force until 1913. The first Ohio law providing a close season for muskrats was passed June 18, 1830. At present this animal has partial protection in a large part of its range, but most of the laws are of comparatively recent enactment. Changes in laws affecting the muskrat may be found in

Farmers' Bulletins of the United States Department of Agriculture, on laws relating to fur animals.¹

The muskrat pelt taken in October or November is worth hardly half as much as if trapped in February. Trappers are often careless of their own interests, and in their eagerness to forestall competitors take the field far too early. Fur dealers, on the other hand, have generally deprecated this policy, and have endeavored to secure reform. Muskrats within the United States should not be trapped before December 15; and while the fur is still prime in the latter part of March, the breeding season is then on, and continued trapping would greatly limit the number of animals for the next season. The open season for the muskrat should be limited to about three months, from December 15 to March 15, or in the more northern States from December 1 to March 15.

¹ Laws Relating to Fur Animals: Annual publication in the Farmers' Bulletin series.